

C. Remarks

The claims are 6-15 and 17-31, with claims 6, 10, 15 and 27 being independent. Claim 16 has been cancelled. Claim 6 has been amended to more clearly define the present invention. Support for this amendment may be found, inter alia, in the specification at page 13, lines 14-16. Claim 10 has been rewritten in independent form. Claim 15 has been amended to include the features of cancelled claim 16 to facilitate rejoinder. New claims 27-31 has been added. Support for this claims may be found, inter alia, in the originally filed specification at page 13, lines 14-16, and in previously cancelled claims 1-5. Reconsideration of the claims is expressly requested.

Claims 11-13 and 15-26 have been withdrawn from consideration.

Applicants again request that these claims be rejoined once the present claims are allowed. Specifically, claims 11-13 are directed to non-elected species and depend, either directly or indirectly, from generic claim 6, which is presently being examined. Claims 15-22 and 26 are subject to rejoinder under M.P.E.P. § 821.04, because they are directed to the method of making a product of the presently examined claims; claim 15 has been amended to be commensurate in scope with, for example, claim 27. Claims 23-25 must be rejoined once claims 15-22 are rejoined and allowed for the same reasons as those mentioned above with respect to claims 11-13.¹

Claims 6-8 and 14 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over JP 6-208076 (Sakamoto) in view of JP 2-109003 (Ota).

^{1/} Applicants note that new claims 29 and 30, which are based on previously withdrawn and cancelled claims 3 and 4, are subject to being examined in the present case upon allowance of claim 27, which is based on elected (and now cancelled) claim 1.

Claims 6-9 and 14 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over JP 60-195502 (Takiguchi) in view of JP 2-109003 (Ota). The grounds of rejection are respectfully traversed.

Prior to addressing the merits of rejection, Applicants would like to briefly discuss some of the key features and advantages of the presently claimed invention. Specifically, the present invention, in part, is directed to a metallic mirror comprising an aluminum or an aluminum alloy substrate, a titanium oxide intermediate layer and a copper reflective layer. The intermediate layer is deposited while adding oxygen under a pressure from 6.65×10^{-3} Pa to 26.6×10^{-3} Pa. As a result of this specific deposition of the intermediate layer, the durability of the mirror is substantially improved.

Sakamoto and Takiguchi both teach a mirror with an aluminum or aluminum alloy substrate, a chromium intermediate layer, a copper reflective layer and an aluminum oxide protective layer. While the Examiner acknowledged that neither of these references discloses a titanium oxide intermediate layer, the Examiner has alleged that Ota teaches that it is well-known to use titanium oxide intermediate layers between a metallic substrate and a copper light reflecting layer in the same field of endeavor for the purpose of increasing durability and optical reflectance. Thus, the Examiner has alleged that it would have been obvious and/or within the level of skill in the art to substitute the chromium intermediate layer in Sakamoto and Takiguchi with a titanium oxide layer taught by Ota to increase durability, etc.

Applicants respectfully disagree with the Examiner's conclusion. However, to even more clearly distinguish the present invention from Sakamoto, Takiguchi and Ota, Applicants have amended the claims to specify that the intermediate layer is deposited

while adding oxygen under a pressure from 6.65×10^{-3} Pa to 26.6×10^{-3} Pa. These conditions result in a production of a substantially improved metallic mirror, i.e., the deposition conditions are not mere process limitations and must be accorded patentable weight, because they affect the formed product. Furthermore, the results achieved when the titanium oxide intermediate layer is deposited while adding oxygen at the presently claimed pressures are unexpectedly superior, as will be discussed below.

The Examiner has relied on Ota for the teachings regarding the intermediate layer. Ota teaches that the intermediate layer in a reflective mirror can be an oxide of chromium, titanium, tungsten, tin, indium or aluminum. Specific examples of such oxides in Ota include chromium oxide, titanium oxide, tungsten oxide, tin oxide, indium oxide and aluminum oxide. Ota states that chromium and tin oxide are ideal. Applicants did not find in Ota one iota of disclosure regarding deposition of a titanium oxide layer in the presence of oxygen at any pressure.

Sakamoto and Takiguchi also fail discloses or suggests depositing an intermediate titanium oxide layer under a pressure from 6.65×10^{-3} Pa to 26.6×10^{-3} Pa, or at any other pressure. In fact, none of the cited references recognize the advantages achieved by adding oxygen in the presently claimed pressure range or problems associated with adding oxygen outside this pressure range. In particular, as mentioned in the specification at page 13, lines 12-24, if the oxygen gas pressure is lower than 6.65×10^{-3} Pa, the underlying aluminum alloy is considered to have a poor affinity for the TiO_2 film, so that film separation tends to occur between the TiO_2 film and the Cu film. If, on the other hand, the pressure is higher than 26.6×10^{-3} Pa, it is considered that the Cu film tends to oxidize, thus reducing reflectance of the mirror. Sakamoto, Takiguchi and Ota are not

cognizant of the problems associated with adding oxygen at pressures other than those presently claimed. Clearly, these references cannot teach or suggest a solution to problems they fail to recognize. Accordingly, it is clear that Ota, even if combined with Sakamoto and Takiguchi, cannot affect the patentability of the presently claimed invention.

Furthermore, Applicants respectfully submit that the presently claimed invention leads to unexpectedly superior results. The Comparative Example and Table 10 in the specification present experimental results, comparing, in relevant part, three mirrors, which are identical, except that one of these mirrors has a chromium intermediate layer (used in Sakamoto and Takiguchi), one has a chromium oxide intermediate layer (ideal layer according to Ota)² and one has a titanium oxide intermediate layer (deposited as in the present invention). The Examiner must consider this data in determining whether unexpected results are provided. See In re Soni, 34 U.S.P.Q.2d (BNA) 1684, 1688 (Fed. Cir. 1995); In re Margolis, 228 U.S.P.Q. (BNA) 940, 941-42 (Fed. Cir. 1986). The results recited Table 10, in relevant part, are as follows:

Intermediate layer material	Corrosion	
	Number of occurrence/number of examinations	Percentage (%)
Cr	125/190	65.8
Cr ₂ O ₃ (without O ₂)	12/60	20.0
TiO ₂ (with O ₂)	6/180	3.3

The data in this table shows that a titanium oxide intermediate layer deposited as presently claimed is over 6 times more effective than the chromium oxide

^{2/} Applicants again note that Ota does not disclose or suggest vacuum deposition while supplying oxygen gas at a specific pressure.

intermediate layer when used in a metallic mirror having an aluminum or aluminum alloy substrate and a copper reflective layer. This is clearly a substantial improvement over what is expected in view of the teachings in Ota.³

As a matter of law, “[g]iven a presumption of similar properties for similar compositions, substantially improved results are ipso facto unexpected.” In re Soni, 34 U.S.P.Q.2d at 1688. Thus, since based on the teachings in Ota a person skilled in the art would have expected a titanium oxide intermediate layer to perform no better than the chromium oxide intermediate layer, a showing that the titanium oxide intermediate layer is actually over 6 more effective than the chromium oxide layer is clearly unexpected and substantial. Thus, even if assumed, arguendo, that the Examiner had set forth a prima facie case of obviousness, the above results would successfully rebut it as a matter of law, shifting the burden back to the Examiner to challenge the adequacy of Applicants’ showing of unexpected, superior results. See In re Soni, 34 U.S.P.Q.2d at 1688.


Applicants submit that new claims 27-31 are patentable over the cited art at least for the reasons discussed above.

In conclusion, Applicants respectfully submit that the cited references, whether considered separately or in any combination, do not disclose or suggest the combination of elements presently claimed. Wherefore, Applicants respectfully request that the outstanding rejections be withdrawn and that the present case be passed to issue.

^{3/} Applicants respectfully submit that based on this disclosure in Ota, a person skilled in the art would have expected a titanium oxide intermediate layer to be no more effective than a chromium oxide layer, which is deemed to be ideal.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address given below.

Respectfully submitted,



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